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A Feeder to Improve the Performance of a
Hand-Operated Groundnut Sheller
Rural Technology Guide No. 4

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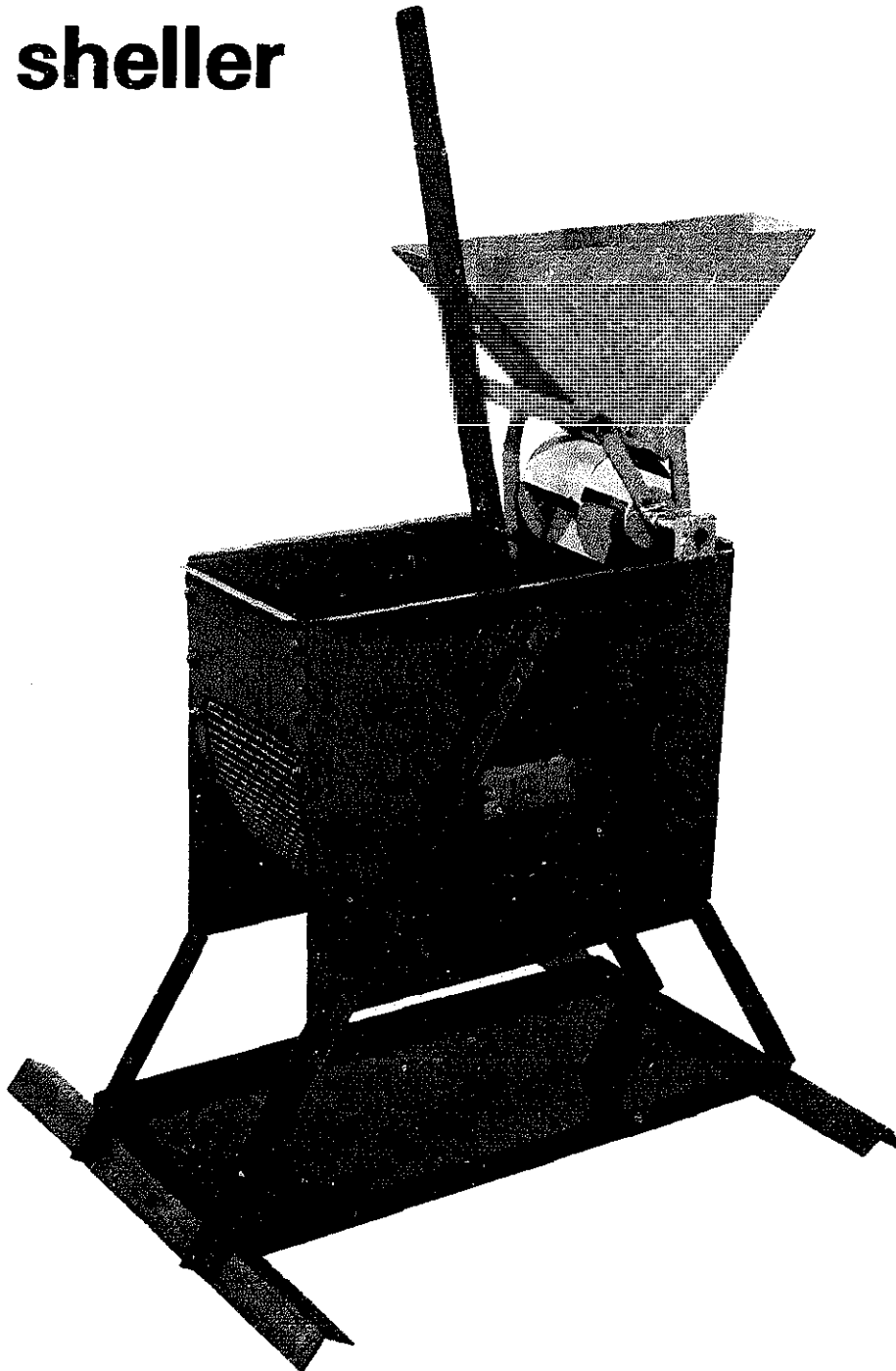
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A feeder to improve the performance of a hand-operated groundnut sheller



A feeder to improve the performance of a hand- operated groundnut sheller

**G A Collins, L D G Coward
and G S Pinson**

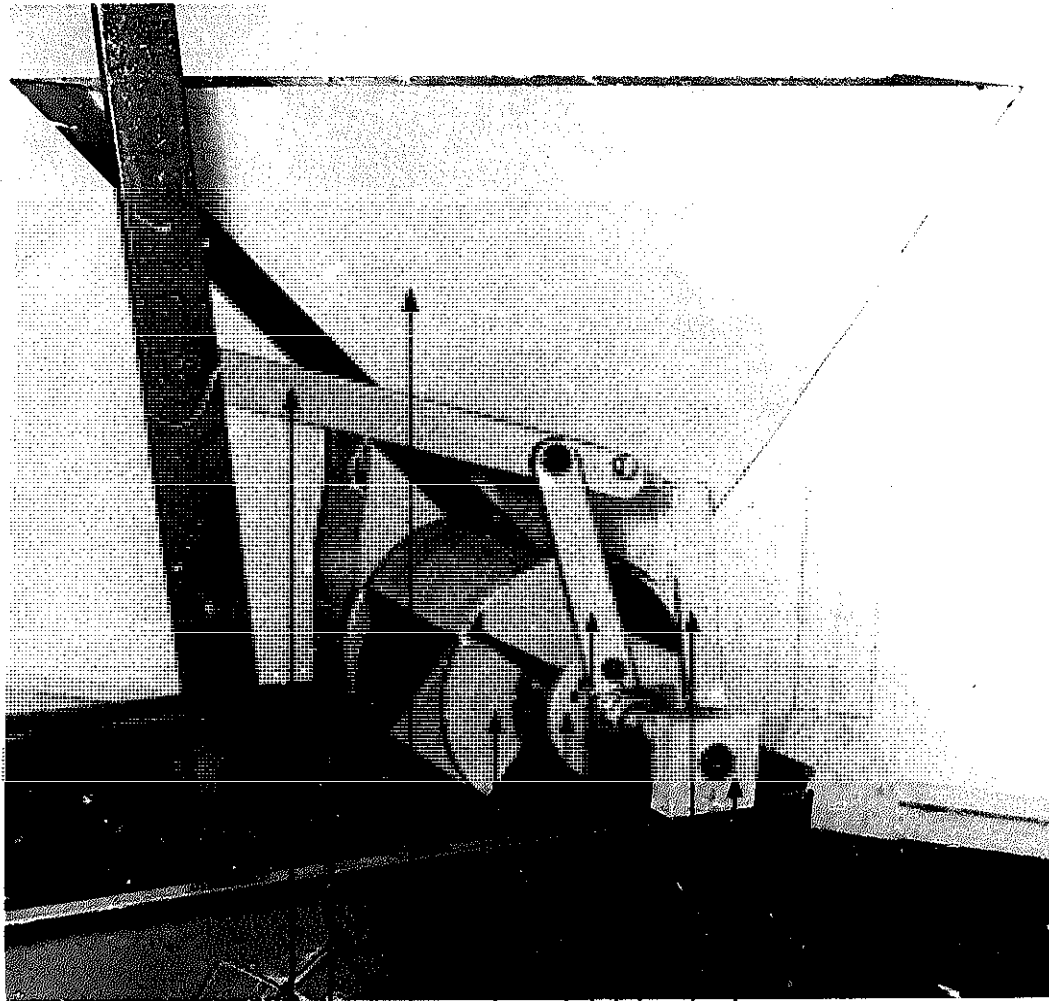
Introduction

This Guide describes how to construct a simple feeding device which will improve the performance of the standard type of hand-operated groundnut sheller. When fitted with this device the sheller will require less effort to operate and will produce fewer broken kernels.

The feeding device, shown in the photograph overleaf is made from steel and can be built in any small, reasonably equipped workshop which has drilling and welding equipment. The instructions and drawings in this Guide should enable a craftsman to construct the feeder.

The document also explains how to set up and test the feeder.

Whilst every attempt has been made to ensure that the design is adaptable to suit different makes of sheller, modifications may be necessary to ensure that the feeder will fit the particular shellers involved.



1 4 9 10 8 6 3 7
2 5

- 1 Handle arm
- 2 Shaft arm
- 3 Hopper support
- 4 Hopper support
- 5 Shaft
- 6 Nut
- 7 Bearing block
- 8 Setting disc
- 9 Hopper
- 10 Feed pocket

Description and manufacture

The device shown in the photograph is designed to be attached to the top lip of existing models of hand-operated groundnut shellers. It consists of a large hopper with a cup valve in the base, which drops a controlled quantity of nuts into the bowl of the machine with each movement of the operating handle. Thus, as the number of nuts in the machine is kept small, the effort needed to operate the machine is lower than normal. The use of the hopper also results in less damage to the individual kernels.

The device can be manufactured in most well equipped workshops. The following special items of equipment (with suitably trained operators) should be available:

1. oxy/acetylene welding set complete with $\frac{1}{8}$ in (3mm) and $\frac{1}{16}$ in (1.5mm) copper-coated welding rods or suitable brazing rods and flux
2. pedestal electric drilling machine.

The following hand tools are required:

1. engineers bench and vice
2. hack-saw and sheet metal cutters
3. set of screw taps
4. various twist drills with sizes up to a diameter of $\frac{3}{8}$ in. (16.25mm)
5. marking out equipment
6. files and general engineering hand tools

The materials required to produce the device are listed on page 4. Construction and assembly instructions are given in the following pages. You are recommended to read these through before starting work.

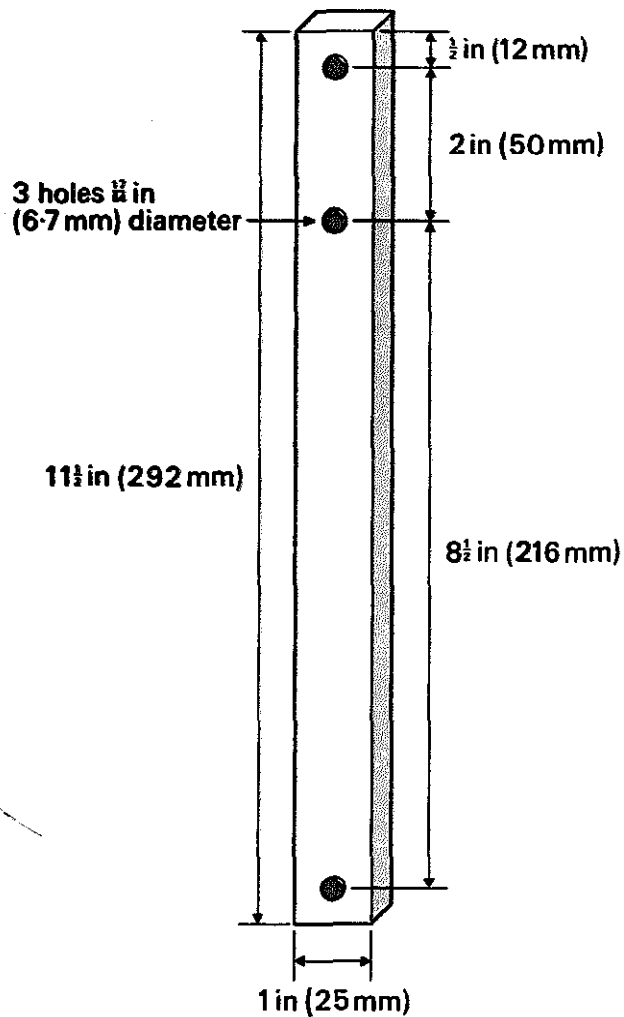
Dimensions are given in inches (with millimetres in brackets). Use only one system: do not mix units. Unless otherwise stated dimensions should be limited to $\pm\frac{1}{8}$ in. (0.4mm) from the given value.

Parts and materials list

Part	Name	Qty.	Material	Amount required	Drawing No.
1	handle arm	1	¼ in. (6mm) mild steel plate	11 ½ in. (292mm) long × 1 in.	1
2	shaft arm	1	¼ in. (6mm) mild steel plate	7 ½ in. (180mm) long × 1 in.	2
3	hopper support	1	¼ in. (6mm) mild steel plate	15 in. (380mm) long × 1 in.	3
4	hopper support	1	¼ in. (6mm) mild steel plate	15 in. (380mm) long × 1 in.	4
8	setting disc	1	¼ in. (6mm) mild steel plate	3 in. (76mm) dia. × 3 in.	8
9	hopper	1	Sheet steel about 1/32 in. or 1mm thick		13
10	feed pocket	1	Sheet steel about 1/32 in. or 1mm thick	To suit width of sheller	11
5	shaft	1	⅝ in. (16mm) nominal diameter bar	2 in. × 2 in. (50mm × 50mm)	5
6	nut	3	approx. ⅝ in. (16mm) thread		6
7	bearing block	2	¾ in. (20mm) mild steel		7
11	bolts (with nuts)	8	¼ in. (6mm) fine × ¾ in. (20mm) long		
		2	¼ in. (6mm) fine with ½ in. (12mm) unthreaded		

Make the feeder in the following stages

First, produce the simple parts as shown in the drawings below:

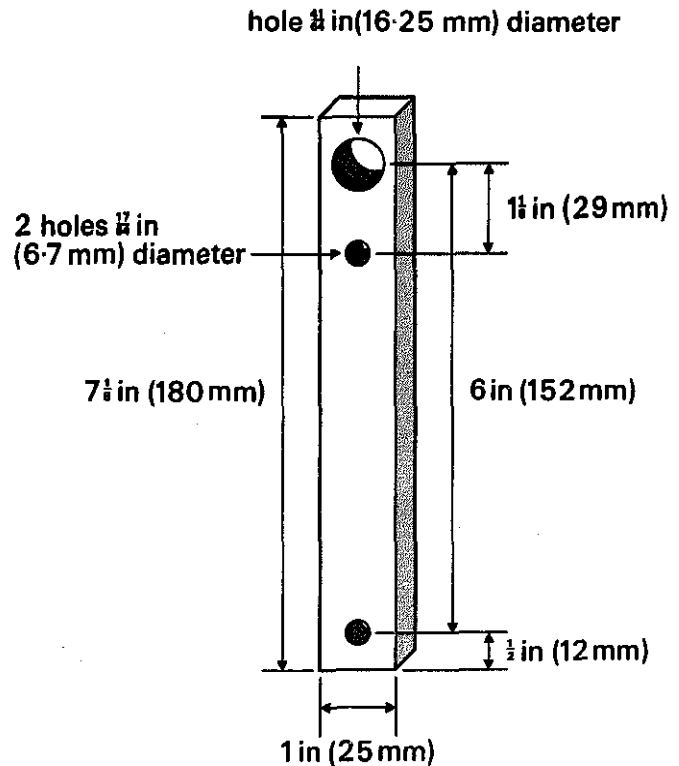


Handle arm

Drawing No. 1: part 1 using $\frac{1}{4}$ in. (6mm) thick steel plate — make 1

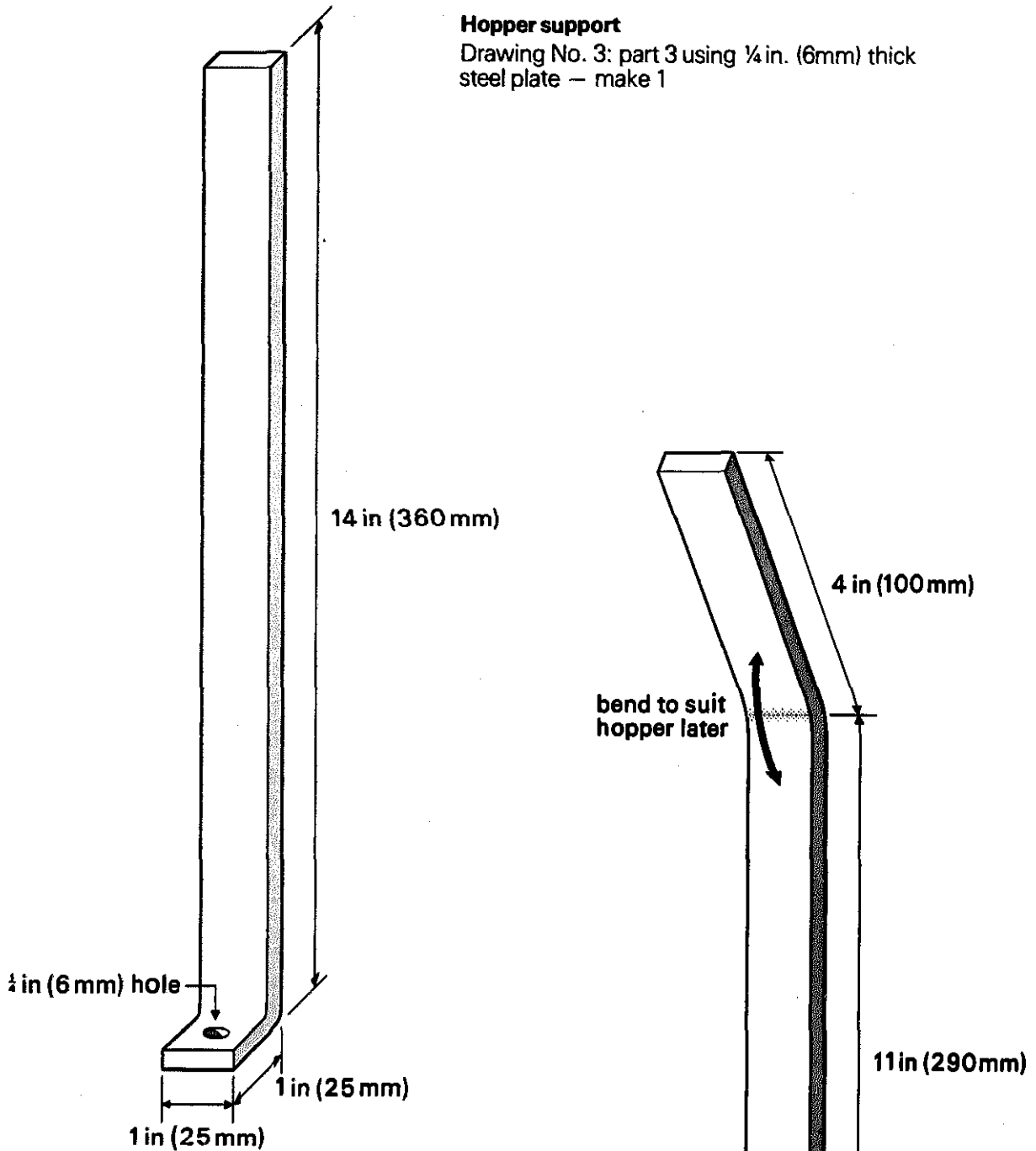
Shaft arm

Drawing No. 2: part 2 using $\frac{1}{4}$ in. (6mm) thick steel plate — make 1



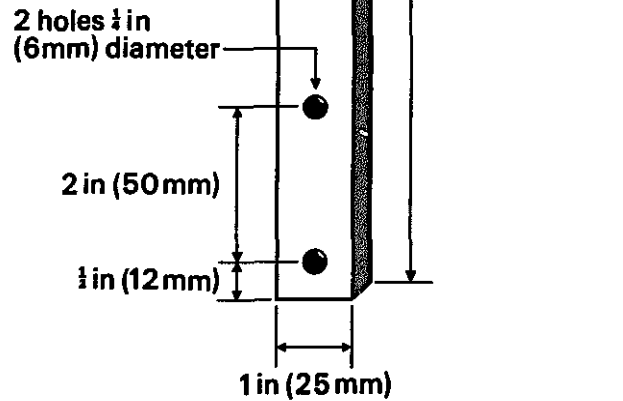
Hopper support

Drawing No. 3: part 3 using ¼ in. (6mm) thick steel plate – make 1



Hopper support

Drawing No. 4: part 4 using ¼ in. (6mm) thick steel plate – make 1

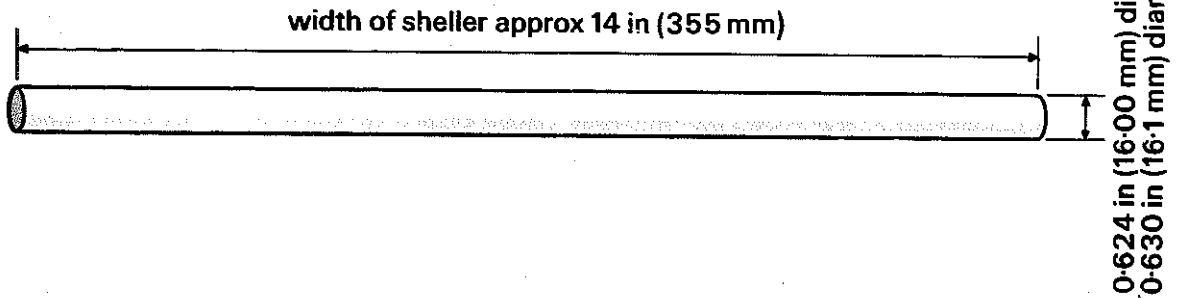


Now produce the parts required for the feeder shaft.

Obtain a length of steel slightly longer than the width of the sheller, with a diameter of approximately $\frac{5}{8}$ in. (16mm) diameter. The central holes in the nuts (part 6), the bearing blocks (7) and setting disc (8) should be drilled out as shown so that they slide and spin freely on the shaft (5).

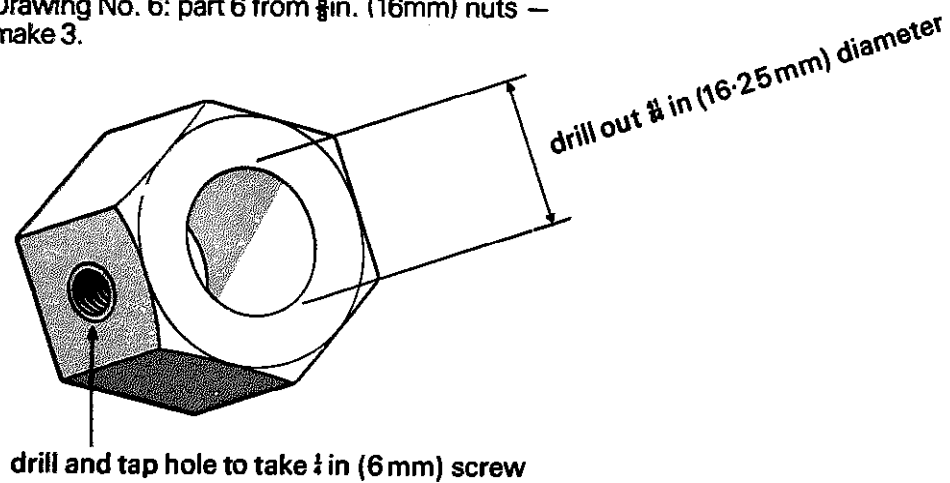
Shaft

Drawing No. 5: part 5 from $\frac{5}{8}$ in. (16mm) nominal diameter steel bar — make 1.



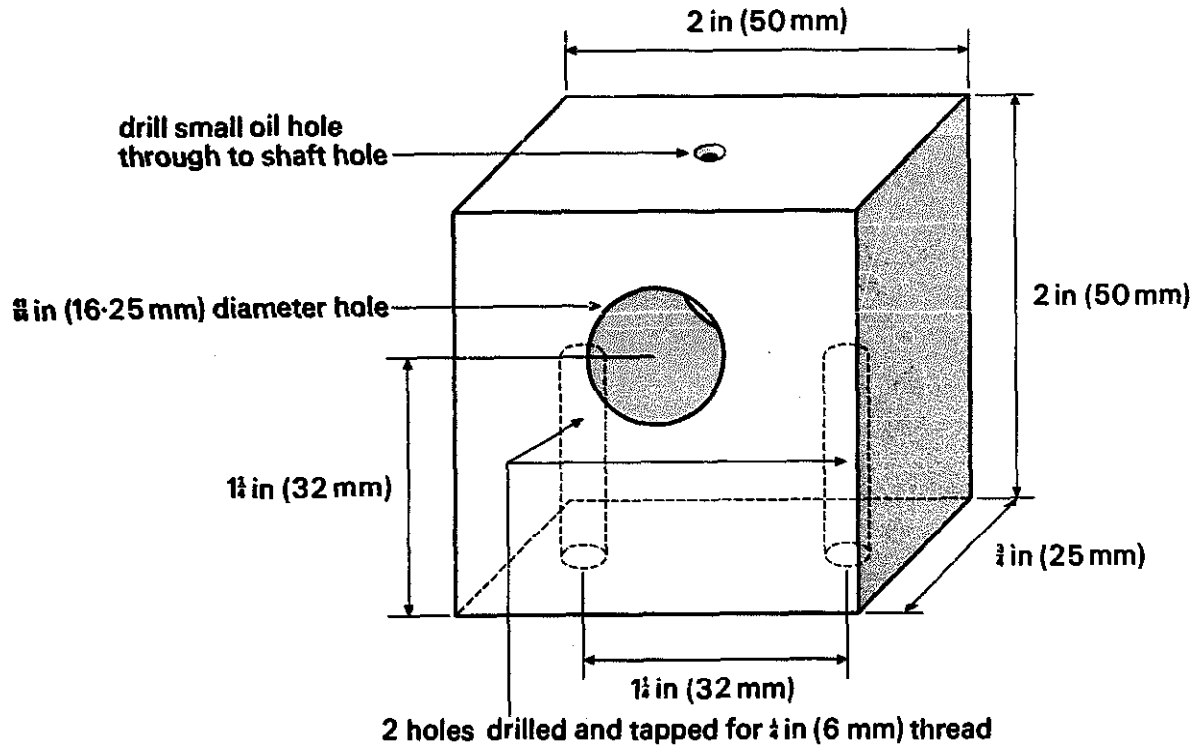
Nut

Drawing No. 6: part 6 from $\frac{5}{8}$ in. (16mm) nuts — make 3.



Bearing block

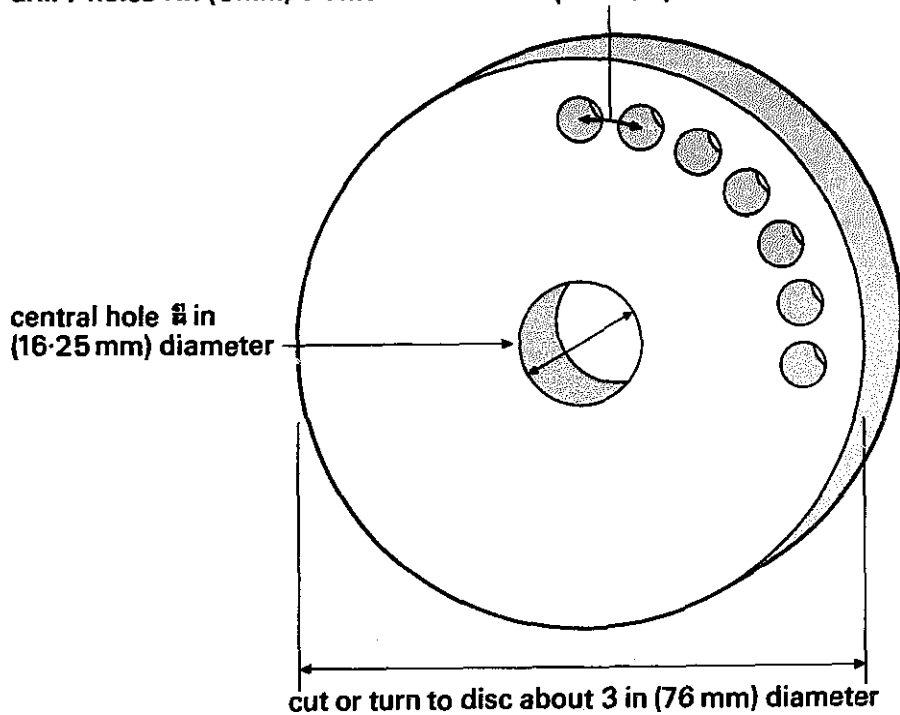
Drawing No. 7: part 7 using $\frac{3}{4}$ in. (20mm) thick steel – make 2



Setting disc

Drawing No. 8: part 8 using $\frac{1}{4}$ in. (6mm) steel plate – make 1

drill 7 holes $\frac{1}{8}$ in (6mm) diameter about $\frac{1}{8}$ in (8 mm) apart on a circle 2 $\frac{1}{2}$ in (58 mm) diameter



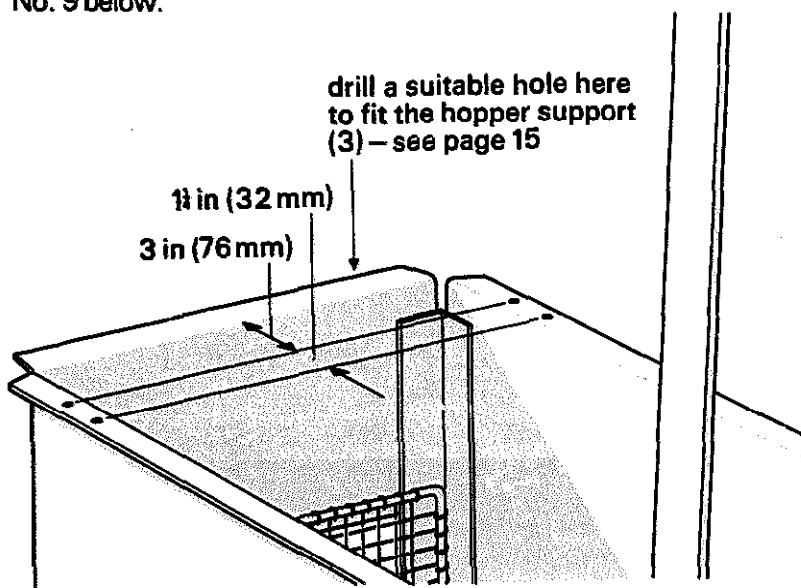
When parts 5, 6, 7 and 8 have been made, fit the shaft and its bearings to the top of the sheller.

Most shellers are made from sheet metal and have a bent-over top edge. Fit the feeder at one end of the machine in such a way that it does not get in the way of operating the handle.

Usually, this handle is mounted towards one side of the sheller shaft. Mount the shaft and hopper for the feeder so that they are on the right-hand side of the operator as he faces the machine, **and on the side away from the handle.**

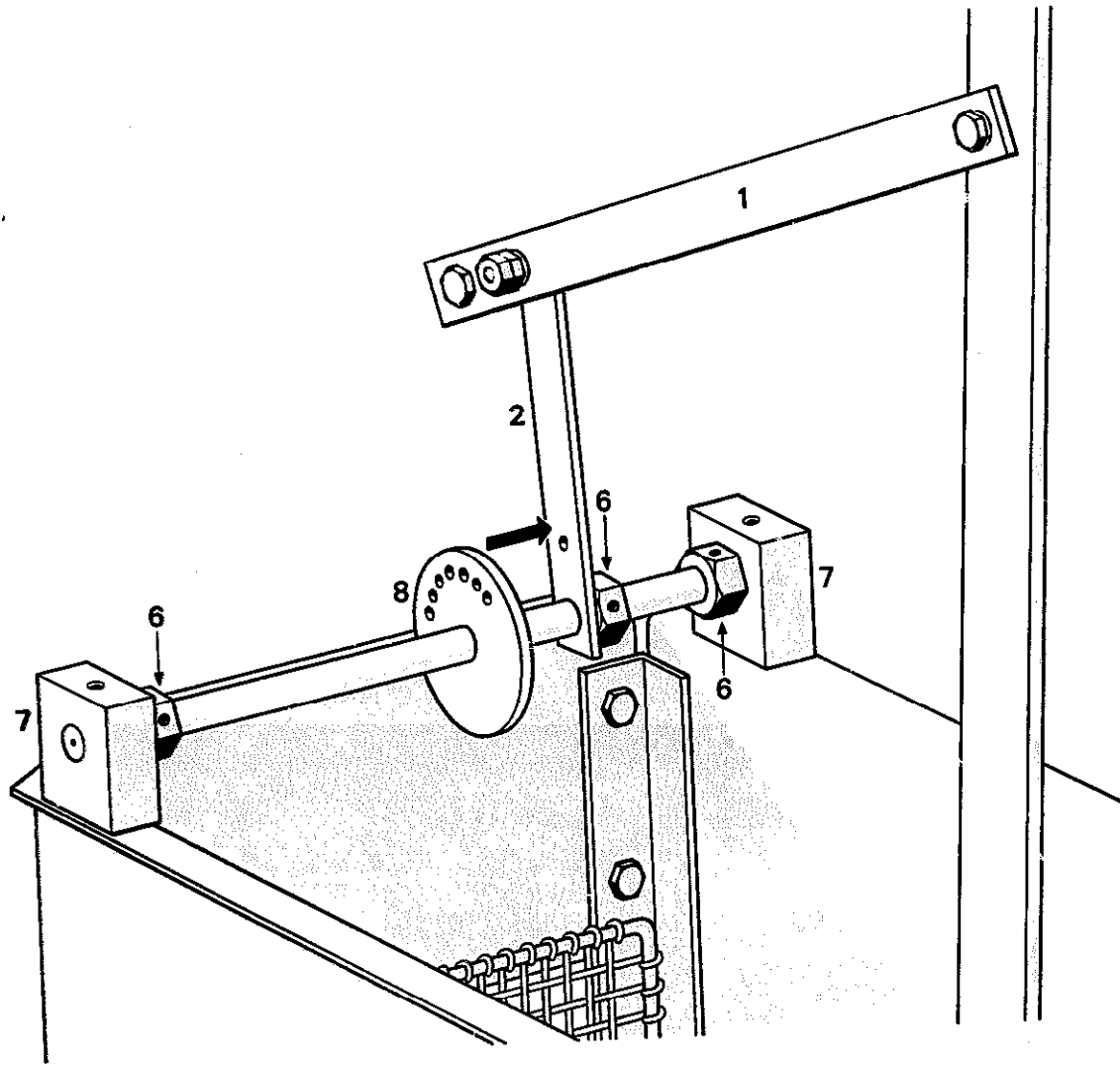
If there is no flat top edge, adapt the design of the bearing blocks so that they are fitted to the vertical sides of the sheller.

To mount the feeder shaft about $3\frac{5}{8}$ in. (92mm) from the end edge, drill 4 holes of $\frac{3}{8}$ in. (8mm) diameter through the top as shown in Drawing No. 9 below.



Fit the bearing blocks (part 7) into the top using $\frac{1}{4}$ in. (6mm) bolts. Position the shaft through the bearing before tightening the bolts, so that it can rotate easily.

Assembly of feeder-shaft
Drawing No. 10.



Now assemble the handle arm (part 1), the shaft arm (2), the setting disc (8) and the three nuts (6) to the shaft and fit into the bearing blocks (7) as shown in Drawing No. 10.

Using $\frac{1}{4}$ in. BSF (6mm) bolts, clamp the two outside drilled nuts (part 6) in position on the shaft so that it cannot slide out of the bearings.

Drill a hole of $\frac{1}{4}$ in. (6.5mm) diameter in the main handle approximately $16\frac{1}{2}$ in. (420mm) from the pivot of the handle.

Connect the handle, handle arm (part 1) and shaft arm (2) to form a freely moving linkage. For pivot pins use $\frac{1}{4}$ in. BSF (6mm) bolts which have about $\frac{1}{2}$ in. (12mm) of unthreaded length below the head. Fit a washer between the bolt head and link, between each link and between the second link and the nuts. Fix the pivot pin with two nuts which are tightened on each other rather than clamping the links. This will firmly fix the nuts on to the bolt but will allow free movement of the join.

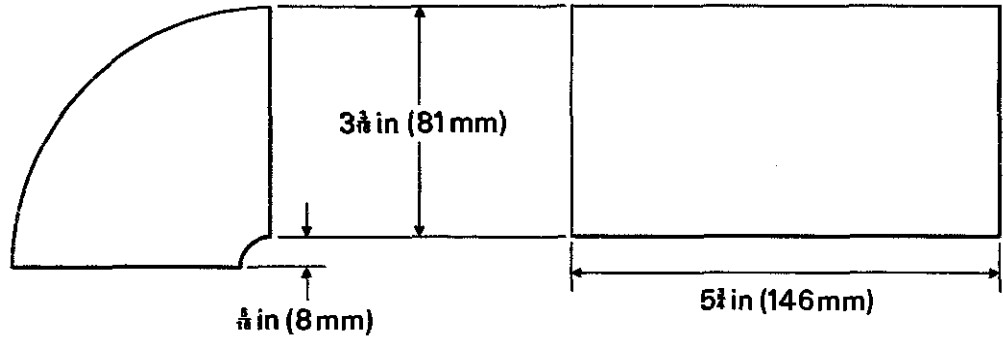
Check that the links move freely when the handle is moved. Mark the position of the setting disc (part 8) on the shaft and weld, but do not braze, it squarely to the shaft on the side of the disc away from the shaft linkage (2). Weld, but do not braze, the centre nut (6) to the shaft linkage (2) ensuring that the linkage is still free to rotate on the shaft. When a bolt is placed through the holes on the link and the setting disc, the main handle will now rotate the feeder shaft. Fit a nut and bolt securely through the hole at the end of the link (1) to limit the movement of the links.

Feed pocket parts

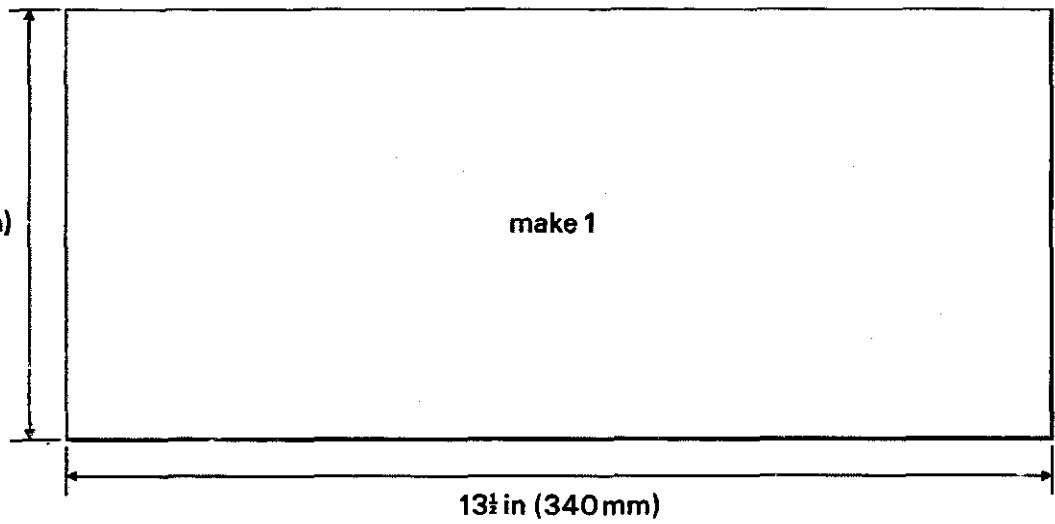
Drawing No. 11: part 10 using sheet steel $\frac{1}{8}$ in.
(1mm) approximately thick

pocket ends – make 2

pocket sides – make 2

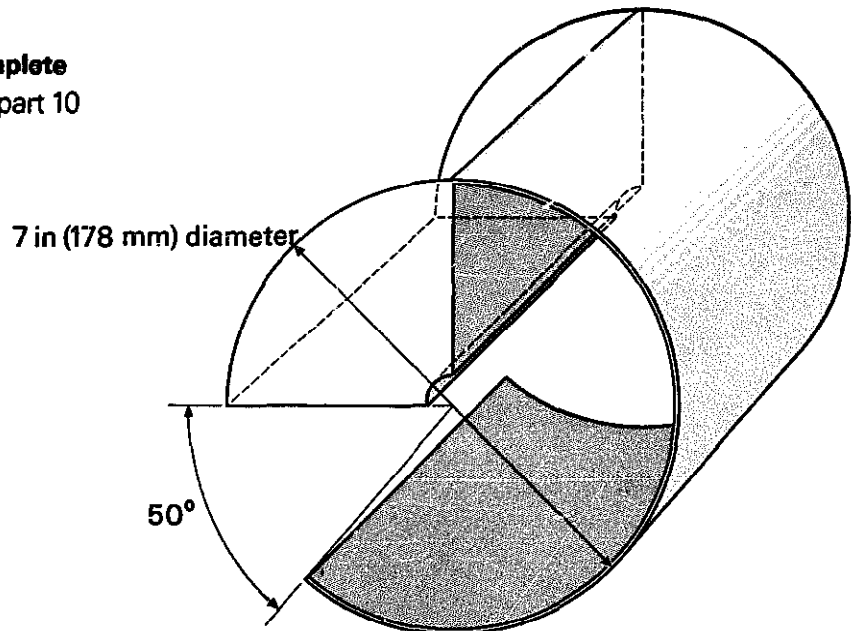


5 1/2 in (146 mm)



Feed pocket-complete

Drawing No. 12: part 10

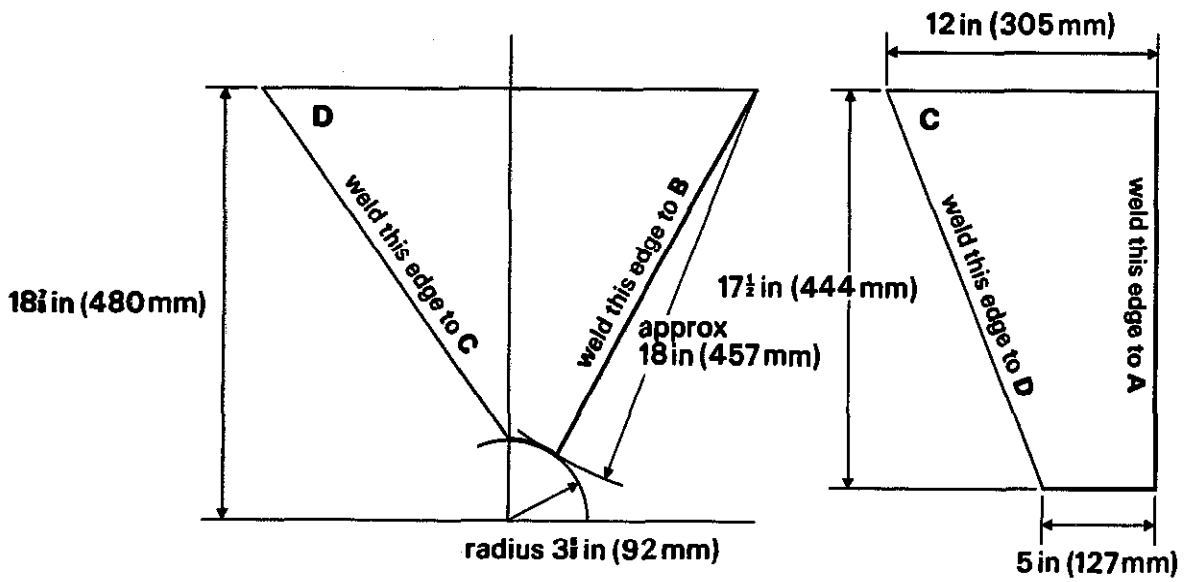
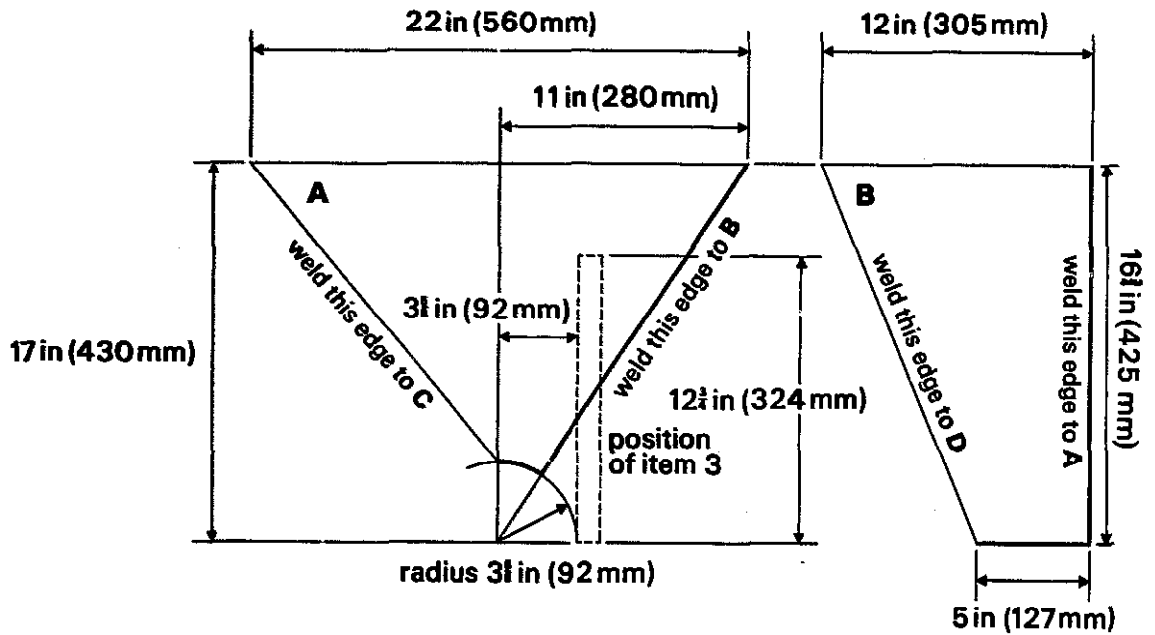


Next make the feed pocket and the hopper.

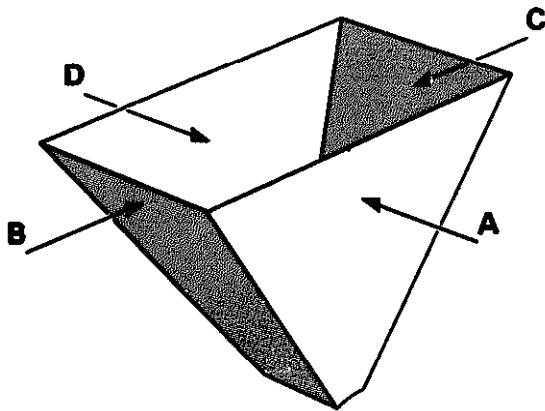
Both of these can be made from sheet steel with a thickness of about $\frac{1}{2}$ in. (1mm). The shapes to be cut out for the feed pocket are shown in Drawing No. 11 and for the hopper in Drawing No. 13.

To make the feed pocket, cut out the five shapes and weld or braze together the two ends and two sides as shown in Drawing No. 12. Bend the large shape around to form about 220° of a circle with a diameter of 7in. (178mm). Weld or braze to the back of the pocket as shown, ensuring that the complete part is circular with about 50° of the circle missing as shown.

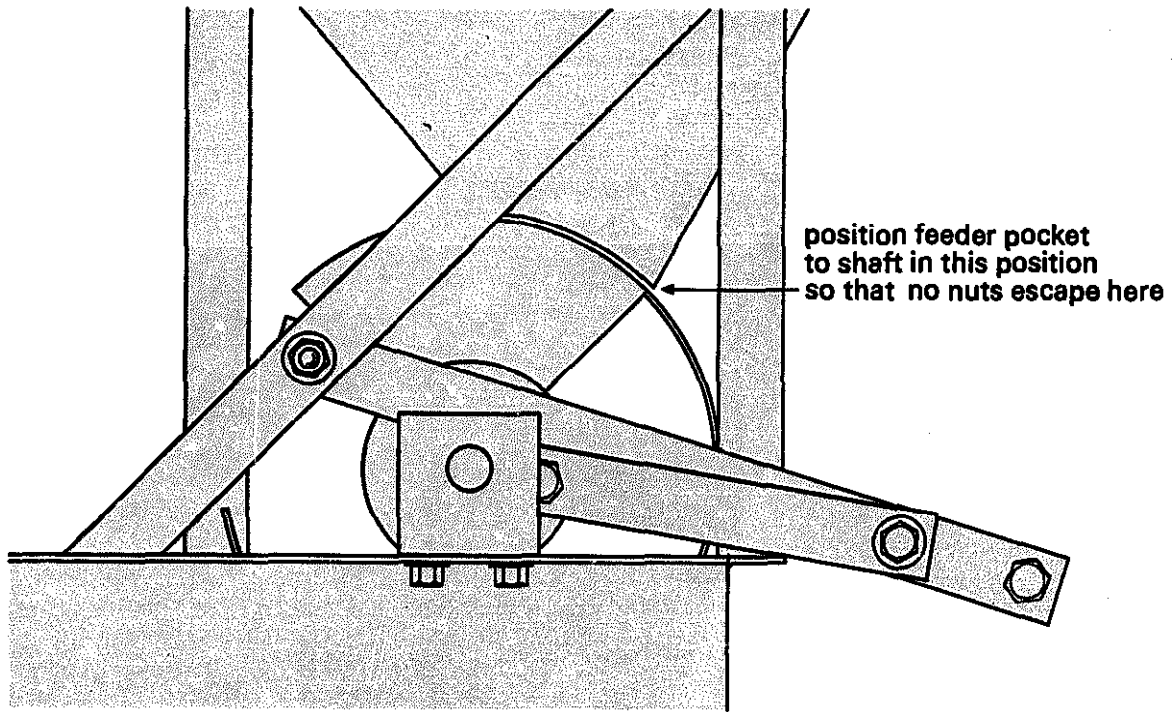
Drawing No. 13: part 9 hopper using sheet steel
 $\frac{3}{8}$ in. (1mm) approximately thick



To make the hopper, first cut out the three sides A, B, and C as shown in Drawing No. 13. Weld these three together keeping the corners square. Mark out side D on a sheet, which is slightly larger than the measurements given on the drawing, and then compare it with the rest of the hopper. Adjust the size of D so that a square-cornered hopper can be welded together. If the joints are to be brazed, cut the parts A and D oversize with a lip $\frac{1}{4}$ in. (6mm) wide bent round on the edges to be joined. Remove sharp edges. Weld or braze hopper support (3) to the outside of the vertical side A of the hopper in the position shown. Drill a hole $\frac{1}{4}$ in. (6mm) in the end top surface of the sheller (see Drawing No. 9) so that the vertical side of the hopper is at least 2in. (50mm) clear of the sheller handle. Take the other hopper support (4) to fix the sloping side of the hopper. Bend this if necessary to provide a good fit. Drill two $\frac{1}{4}$ in. (6mm) diameter holes in the side of the sheller to match the two holes in part 4. Bolt them together and weld or braze the top end of part 4 to the hopper; tack at first and complete the welds after the whole unit has been assembled.



Drawing No. 14: Setting of the feeder pocket



With the hopper in position, the feed pocket can now be fitted to the shaft in the required position.

To find this position, first fix the setting disc (part 8) to the shaft arm (2) using a ¼ in. (6mm) bolt and nut using the middle of the seven holes in the disc. Move the sheller handle towards the hopper end until its upper end has moved as far as it will go. Now position the feed pocket on the shaft so that it fits below the base of the hopper as shown in Drawing No. 14. Weld or braze to the shaft, having made sure that no nuts can fall out of the back of the hopper and that when the handle is moved backwards and forwards there are no large gaps and no rubbing between the parts. Complete the welds on the hopper, and paint to provide a rust-proof surface. Oil the joints lightly.

The sheller is now ready for testing and full operation.

Setting up and testing

Before using the device, check whether the correct size of screen is being used. The best method of selecting a screen is to take a sample of nuts and push them, end on, through one of the holes in the screen. If the hole is too large the nuts will pass through without breaking the shells. If it is too small the kernels are damaged. If the shells are crushed and most kernels pass through undamaged, the screen size is correct. However, the variation in size of the nuts is such that whatever size of screen is used, a proportion of the kernels is damaged or a proportion of the nuts is unshelled.

Before testing, fix the feeding cup pocket into the correct position using the range of holes provided on the setting disc (8). Operate the handle and using a small quantity of nuts, check that the nuts fall correctly into the machine. If too many nuts fall into the machine for easy operation use another hole in the setting disc so that fewer nuts are passed.

The groundnut sheller is now ready for full operation.

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